

## PATENT ABSTRACTS OF JAPAN

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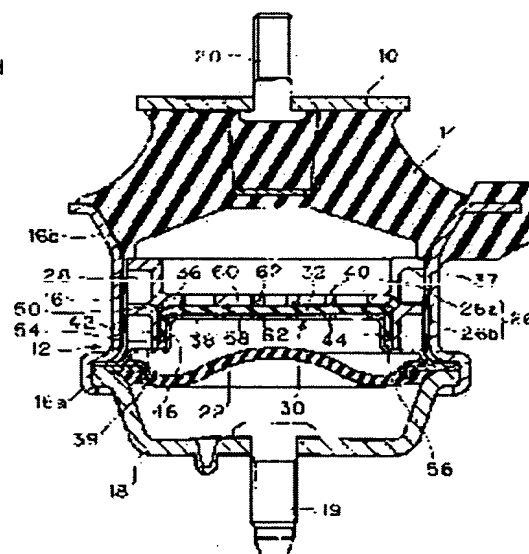
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## (54) FLUID FILLING-IN VIBRATION-RESISTANT DEVICE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To prevent a periphery of an elastic film from flapping in a partitioning member and improve assembling capability in a fluid filling-in vibration-resistant device.**SOLUTION:** In the vibration-resistant device, first and second installing members 10 and 12 are combined each other via a vibration-resistant base body 14, a fluid filling-in chamber 26 arranged between the vibration-resistant base body 14 and diaphragm 22 is partitioned into two chambers by means of a partitioning member 30, and two chambers 26a and 26b are connected each other by an orifice 28. The partitioning member 30 comprises an elastic film 32 partitioning two chambers 26a and 26b, an orifice member 36 providing a lattice 40 relatively arranged on an upper surface of the elastic film 32 and a longitudinal wall 42 extended from a periphery of the lattice 40, and a partitioning plate 38 providing a lattice 44 relatively arranged on a lower surface of the elastic film 32 and a longitudinal wall 46 relatively arranged on an inner peripheral side of the longitudinal wall 42 by extending from a periphery of the lattice 44. A longitudinal wall portion 54 is integrally extended from a periphery of the elastic film 32, and the longitudinal wall portion 54 is inserted into a gap between the longitudinal walls 42 and 46.

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## CLAIMS

## [Claim(s)]

[Claim 1] The vibrationproofing base which consists of the 1st attachment member, the 2nd attachment member, and rubber material that is interposed between these attachment members and combines both the attachment member, The diaphragm which was made to counter said vibrationproofing base and was attached in said 2nd attachment member, The fluid enclosure room prepared between the aforementioned vibrationproofing base and diaphragm, and the batch member which divides said fluid enclosure room into the 1st room by the side of a vibrationproofing base, and the 2nd room by the side of diaphragm, It has the orifice which makes the 1st aforementioned room and the 2nd room open for free passage. Said batch member The part I material equipped with the 1st wall which is installed from the 1st grid which is faced and allotted to the field on the other hand, and restricts the variation rate and its periphery section of the elastic membrane into which the 1st aforementioned room and the 2nd room are divided, and this elastic membrane, and encloses the periphery of said elastic membrane, And it is installed from the 2nd grid which is faced and allotted to the another side side of said elastic membrane, and restricts the variation rate, and its periphery section, and consists of part II material equipped with the 2nd wall faced and arranged on the inner circumference side of said 1st wall. Said elastic membrane is a fluid filled system vibration isolator characterized by having the wall section which was installed in one from the periphery section, and was inserted in the gap of the 1st aforementioned wall and the 2nd wall.

[Claim 2] The fluid filled system vibration isolator according to claim 1 characterized by preparing the protruding line which regulates migration of the fluid between the through tubes which enclose each through tube formed of this grid over the perimeter between the front face of said elastic membrane and the field of said 1st and 2nd grids which counter this, and adjoin it.

[Claim 3] The fluid filled system vibration isolator according to claim 2 characterized by preparing said protruding line in the field of said grid which counters the front face of said elastic membrane, or this at one.

[Claim 4] Said grid consists of two or more annular sections prolonged in a hoop direction, and the connection section which is prolonged in radial and connects said two or more annular sections, and two or more trains of through tube trains which come to arrange two or more through tubes to a hoop direction in this grid are established. Here Two or more annular heights which said connection section is allotted in a pitch which is different by the inner circumference [ of said grid ], and periphery side, and said protruding line is prepared in said elastic membrane, and are prolonged in a hoop direction corresponding to said annular section of said grid, It is the fluid filled system vibration isolator according to claim 2 or 3 which consists of two or more radial heights prolonged in a radial corresponding to said connection section of said grid, and is characterized by having prolonged said radial heights in the radial at the equal include angle covering the radial abbreviation overall length of said elastic membrane.

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the fluid filled system vibration isolator used for mainly supporting oscillating objects, such as an automobile engine, in vibrationproofing.

[0002]

[Description of the Prior Art] The 1st fixing metal with which a fluid filled system vibration isolator is generally attached in an oscillating generating object side, such as an engine. The 2nd tubed fixing metal by which attachment immobilization is carried out at the support side of a car-body frame etc. Join together through the vibrationproofing base which consists of rubber material, and counter with a vibrationproofing base and diaphragm is allotted to the lower part side of the 2nd fixing metal of the above. Make a room into a fluid enclosure room among between a vibrationproofing base and diaphragm, and this fluid enclosure room is divided into two by the side of a vibrationproofing base and diaphragm by the batch member. It is constituted so that it may make it come to be open for free passage of both \*\* with an orifice and a periodic-damping function may be achieved according to the liquid convection effect between both the liquid rooms by the orifice, or the vibration-deadening effectiveness of a vibrationproofing base.

[0003] In this fluid filled system vibration isolator, what was constituted from elastic membrane as valve portion material which carries out reciprocation displacement of the batch member, and a grid of the vertical pair which restricts a motion of this elastic membrane is well-known. Under vibration of the large amplitude with a low frequency like vibration resulting from the irregularity of the road surface at the time of car transit, the vibration isolator with such elastic membrane demonstrates a periodic-damping function because a fluid flows for two rooms through an orifice. On the other hand, under vibration of tiny vibration width of face with a high frequency like vibration resulting from an engine rotational frequency, the above-mentioned orifice does not function but demonstrates a periodic-damping function according to reciprocation deformation of elastic membrane.

[0004] What was constituted from a grid of a vertical pair and elastic membrane held between these grids in the French patent public presentation No. 2674590 official report as a batch member into which an up-and-down liquid room is divided is indicated. In this official report, in order to pinch the center section between up-and-down grids, to prepare elastic membrane so that a edge may float, and to prevent generating of the collision sound of elastic membrane and a grid, or the noise which is not desirable, the circular projection which counters a grid is prepared in one [ at least ] field of elastic membrane. This circular projection is equally arranged in the condition of having stood in a line in the shape of a ring on the surface of elastic membrane, and has the function which is gradually pressed by the grid and subsequently loosens elastically at the time of actuation of elastic membrane.

[0005] Moreover, although it is sequential in [ not elastic membrane but a grid ] include angle in order to prevent like the above generating of the collision sound of elastic membrane and a grid, or the noise which is not desirable to JP,6-221368,A, the technique of preparing the rib of the inhomogeneity which does not have a repeat in include angle over the whole surroundings of an axis is indicated.

[0006]

[Problem(s) to be Solved by the Invention] According to the vibration isolator of the above-mentioned conventional technique, although a certain extent can reduce a collision sound and the noise with a circular projection or a rib, since the periphery section of elastic membrane is not restrained at all, it is difficult [ it ] to be generated with \*\*\*\* in the periphery section of elastic membrane by rapid change of fluid pressure, and to not necessarily prevent generating of a collision sound or the noise fully. Moreover, in case the periphery section of elastic membrane is turned over or elastic membrane is inserted between grids at the time of the assembly of a batch member, in plate-like elastic membrane, there is a problem that it is inferior also to assembly nature that it is hard to insert etc.

[0007] Moreover, the above-mentioned circular projection and a rib are prepared in order to mitigate the impulsive sound at the time of colliding with a grid because elastic membrane displaces up and down, and they do not restrict migration of a hoop direction or radial mounting fluid between the through tubes formed of a grid. Therefore, in the above-mentioned vibration isolator, migration (leak) of mounting fluid takes place between the through tubes which adjoin under vibration of the large amplitude with a low frequency, and it is hard to demonstrate the higher engine performance.

[0008] This invention makes it the 1st technical problem to improve assembly nature while it is made in view of such a point and prevents with [ of the periphery section of the elastic membrane in a batch member ] \*\*\*\*. Let it be the 2nd technical problem for this invention to prevent unnecessary leak of the enclosure fluid between the through tubes of a batch member again, and to improve vibration-proof ability.

[0009]

[Means for Solving the Problem] The fluid filled system vibration isolator of this invention which solves the 1st technical problem of the above The vibrationproofing base which consists of the 1st attachment member, the 2nd attachment member, and rubber material that is interposed between these attachment members and combines both the attachment member. The diaphragm which was made to counter said vibrationproofing base and was attached in said 2nd attachment member. The fluid enclosure room prepared between the aforementioned vibrationproofing base and diaphragm, and the batch member which divides said fluid enclosure room into the 1st room by the side of a vibrationproofing base, and the 2nd room by the side of diaphragm. It has the orifice which makes the 1st aforementioned room and the 2nd room open for free passage. Said batch member The part I material equipped with the 1st wall which is installed from the 1st grid which is faced and allotted to the field on the other hand, and restricts the variation rate and its periphery section of the elastic membrane into which the 1st aforementioned room and the 2nd room are divided, and this elastic membrane, and encloses the periphery of said elastic membrane. And it is installed from the 2nd grid which is faced and allotted to the another side side of said elastic membrane, and restricts the variation rate, and its periphery section, and consists of part II material equipped with the 2nd wall faced and arranged on the inner circumference side of said 1st wall. Said elastic membrane is equipped with the wall section which was installed in one from the periphery section, and was inserted in the gap of the 1st aforementioned wall and the 2nd wall.

[0010] In the fluid filled system vibration isolator of this invention, since it is prevented with [ of the elastic membrane periphery section by rapid change of fluid pressure ] \*\*\*\* by the wall section prepared in the periphery section of elastic membrane, generating of the collision sound of elastic membrane and a grid or the noise which is not desirable can be prevented. moreover, the insertion nature at the time of

discernment of the front flesh side of elastic membrane becoming easy, and inserting in the part I material by the above-mentioned wall section, — excelling — further — the elastic membrane periphery section — also being turned over — since it can prevent, the assembly nature of a batch member improves.

[0011] In the fluid filled system vibration isolator of this invention, in order to solve the 2nd technical problem of the above, it is desirable to prepare the protruding line which regulates migration of the fluid between the through tubes which enclose each through tube formed of this grid over the perimeter between the front face of said elastic membrane and the field of said 1st and 2nd grids which counter this, and adjoin it.

[0012] Thus, by having prepared the protruding line which encloses each through tube over elastic membrane and the grid which counters this in the perimeter, the leakage of the fluid between the through tubes by which the above-mentioned protruding line adjoins under vibration of the large amplitude especially with a low frequency is prevented. Therefore, elastic membrane can be sagged for every through tube, and a high loss factor is acquired. Moreover, under vibration of tiny vibration width of face with a high frequency, you may make it a fluid move exceeding the above-mentioned protruding line, the fluid which moves in that case exceeding a protruding line eases a fluid pressure difference, and a low dynamic spring constant is demonstrated.

[0013] The above-mentioned protruding line can be prepared in the field of the grid which counters the front face of elastic membrane, or this at one.

[0014] It consists of two or more annular sections to which said grid extends in a hoop direction, and the connection section which is prolonged in radial and connects said two or more annular sections, and two or more trains of through tube trains which come to arrange two or more through tubes to a hoop direction in this grid are more specifically established. Here Two or more annular heights which said connection section is allotted in a pitch which is different by the inner circumference [ of said grid ], and periphery side, and said protruding line is prepared in said elastic membrane, and are prolonged in a hoop direction corresponding to said annular section of said grid. It may consist of two or more radial heights prolonged in a radial corresponding to said connection section of said grid, and said radial heights may be prolonged in the radial at the equal include angle covering the radial abbreviation overall length of said elastic membrane. In this case, although there are some radial heights which do not appear on the connection section of a grid, even if it is the protruding line from which it separated from the grid in this way, bending behavior for every through tube of elastic membrane is not barred. Therefore, the protruding line equally arranged by the circumference of the axis of elastic membrane does not give trouble to a function, either.

[0015]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained with reference to a drawing.

[0016] Drawing of longitudinal section of the fluid filled system vibration isolator which drawing 1 requires for 1 operation gestalt of this invention, and drawing 2 are the exploded view. This vibration isolator comes to join together the 1st fixing metal 10 attached in an oscillating generating object side, such as an engine, and the 2nd tubed fixing metal 12 by which attachment immobilization is carried out at the support side of a car-body frame etc. through the vibrationproofing base 14 which consists of rubber material.

[0017] The 2nd fixing metal 12 consists of tubed metallic ornaments 16 and bottom metallic ornaments 18 concluded by the lower limit 16a with the caulking means, and the bolt 19 for attachment protrudes on the bottom metallic ornaments 18.

[0018] The 1st fixing metal 10 is the plate-like part material which set necessary spacing to the axial center section upper part of the 2nd fixing metal 12, and was allotted to it, and the bolt 20 for attachment protrudes on the center section towards the upper part.

[0019] The 1st fixing metal 10 fixed [ the appearance ] the abbreviation truncated cone form with the vulcanization shaping means on nothing and its top face, and the upper limit section of the 2nd fixing metal 12 has fixed the vibrationproofing base 14 with the vulcanization shaping means in the lower limit periphery section. In the case of drawing, diameter expansion formation of the upper limit section 16b of the tubed metallic ornaments 16 is carried out at the shape of a taper, and vulcanization adhesion of the lower periphery of the vibrationproofing base 14 is carried out at this upper limit section 16b. Thin film rubber section 14a installed in the shape of a thin film from the vibrationproofing base 14 is prepared in the internal surface of the 2nd fixing metal 12.

[0020] The lower part side of the 2nd fixing metal 12 is equipped with the diaphragm 22 which consists of rubber membrane so that it may counter with the vibrationproofing base 14. Diaphragm 22 equips the periphery section with the ring-like reinforcement metallic ornaments 24, and it is attached in the 2nd fixing metal 12 by these reinforcement metallic ornaments 24 making it go away with the tubed metallic ornaments 16 and the bottom metallic ornaments 18, and caulking immobilization being carried out at the section.

[0021] Inside the 2nd fixing metal 12, the fluid enclosure room 26 sealed between diaphragm 22 and the vibrationproofing base 14 is formed, and the liquid as a fluid is enclosed with this fluid enclosure room 26. the disc-like batch member 30 which has an orifice 28 at a periphery in the inner circumference of the 2nd fixing metal 12 in the fluid enclosure room 26 — liquid — it is attached densely. The fluid enclosure room 26 is divided into 1st room 26a by the side of a vibrationproofing base, and 2nd room 26b by the side of diaphragm by this batch member 30, and both \*\* 26a and 26b are made open for free passage by the orifice 28.

[0022] The batch member 30 consists of disc-like rubber membrane 32 as valve portion material which divides 1st room 26a and 2nd room 26b, an orifice member 36 equipped with the slot 34 for forming an orifice 28 in a periphery, and a dashboard 38 that presses the periphery edge of the orifice member 36 to the vibrationproofing base 14 side.

[0023] The orifice member 36 is a metal or the mold Plastic solid of resin, and is equipped with the grid 40 faced and allotted to the top face of rubber membrane 32, and the wall 42 which is installed from the periphery section and encloses the periphery of rubber membrane 32. The orifice member 36 becomes a detail from the cylinder-like wall 42 and the circular grid 40 over which it was built so that the interior might be divided up and down in a shaft-orientations center section. And the slot 34 which extends over 2 rounds of upper and lower sides is formed in a hoop direction at the peripheral face of a wall 42, and let space surrounded by this slot 34 and thin film rubber section 14a of the vibrationproofing base 14 be an orifice 28.

[0024] A dashboard 38 is the press-forming object of a metal plate, and is equipped with the grid 44 faced and allotted to the inferior surface of tongue of rubber membrane 32, and the wall 46 which is installed from the periphery section, and is faced and arranged on the inner circumference side of the wall 42 of the orifice member 36. The grid 44 to which a dashboard 38 becomes a detail from the circular central shelf projected up. It consists of a periphery edge 48 installed by the method of the outside of the direction of a path from the lower limit of the cylinder-like wall 46 caudad installed from the periphery section, and a wall 46, and the periphery edge 48 is attached in the 2nd fixing metal 12 by making it go away with the tubed metallic ornaments 16 and the bottom metallic ornaments 18, and caulking immobilization being carried out at the section.

[0025] The openings 37 and 39 for making 1st room 26a and 2nd room 26b open an orifice 28 for free passage are formed in the orifice member 36 and the dashboard 38, respectively.

[0026] Rubber membrane 32 is allotted in the clearance (hold space) 50 formed between the grid 40 of the orifice member 36 which faced 1st room 26a, and the grid 44 of the dashboard 38 facing 2nd room 26b, and the variation rate of the vertical direction is restricted between both the grids 40 and 44. the dimension (height) of a clearance 50 is greatly set up a little rather than the thickness of rubber membrane 32 — having — \*\*\*\* — thereby — vertical movement of rubber membrane 32 — the variation rate is made possible.

[0027] Rubber membrane 32 is formed in saccate [ which bent the periphery edge caudad ] as shown in drawing 3. That is, rubber membrane 32 consists of a disc-like body 52 and the wall section 54 caudad installed in one from the periphery section. And this wall section 54 is inserted in the gap 56 formed between the wall 42 of the orifice member 36, and the wall 46 of a dashboard 38 as shown in drawing 1. the

dimension of this gap 56 is greatly set up a little rather than the thickness of the wall section 54, and a clearance secures it, respectively between the wall section 54 and its internal external walls 42 and 46 — having — \*\*\*\* — thereby vertical movement of rubber membrane 32 — the variation rate is possible. Moreover, the shaft-orientations die length (height) of wall section 54 is set up so that the lower limit may not contact the periphery edge 48 of a dashboard 38.

[0028] The grid 40 of the orifice member 36 and the grid 44 of a dashboard 38 have the same grid configuration. As shown in drawing 5, the grid 44 of a dashboard 38 becomes a detail from connection section 44b which connects between three concentric annular sections 44a prolonged in a hoop direction, and the two annular sections which prolong and adjoin radial. Connection section 44b is allotted in a pitch which is different by the inner circumference [ of a grid 44 ], and periphery side, in the case of drawing, connection section 44b by the side of inner circumference is prepared at intervals of 90 degrees, and eight connection section 44b by the side of 4 and a periphery is prepared at intervals of 45 degrees. Moreover, both shift 22.5 degrees of phases and are prepared so that all of connection section 44b by the side of inner circumference and connection section 44b by the side of a periphery may not be in agreement. Although the through tube train which comes to arrange the through tube 58 of the shape of two or more slot is prepared in a hoop direction in this grid 44 at two trains by the side of inner circumference and a periphery, as for a through tube 58, eight pieces are prepared by the four-piece and periphery side by the inner circumference side by having changed the pitch of connection section 44b as mentioned above. Thus, by lessening the number of through tubes 58 by the inner circumference side, the opening area of each through tube 58 by the side of inner circumference is greatly securable to the same extent a periphery side. It is the same configuration as the grid 44 of the dashboard 38 which also described above the grid 40 of the orifice member 36, therefore the through tube 60 is formed in the orifice member 36 by the same configuration and the arrangement as the through tube 58 of a dashboard 38. And the orifice member 36 and a dashboard 38 are attached so that it may be allotted to the location whose mutual through tubes 58 and 60 corresponded.

[0029] The protruding line 62 which encloses the periphery of each through tubes 58 and 60 over the perimeter in contact with the field where the above-mentioned grids 40 and 44 counter is projected and formed in the front face of rubber membrane 32 at one. The protruding line 62 is formed in vertical both sides of rubber membrane 32 in the same configuration, as shown in drawing 4. As shown in drawing 5, specifically, a protruding line 62 consists of radial heights 62b prolonged in a radial corresponding to three connection sections of concentric annular heights 62a and grid 44 extend in hoop direction corresponding to annular section 44a of grid 44 44b. This radial heights 62b is prolonged covering the radial abbreviation overall length from the core of rubber membrane 32. Moreover, radial heights 62b is prepared at intervals of 22.5 degrees as appeared in all connection section 44b of a grid 44 in at least one, and so that a radial may be prolonged at an equal include angle.

[0030] As mentioned above, under vibration of the low large amplitude (for example,  $\approx 0.3\text{mm}$  or more) of a frequency, when a fluid flows between two-room 26a and 26b through an orifice 28, as for the vibration isolator of this becoming operation gestalt, a periodic-damping function is demonstrated. Moreover, the leakage of the fluid between the through tube 58 which adjoins a hoop direction or radial, and 60 is prevented by contacting the bearing side of grids 40 and 44 where the protruding line 62 prepared in rubber membrane 32 faces. Therefore, rubber membrane 32 can be sagged for every [ each through tube 58 and ] 60, and a high loss factor is acquired. On the other hand, under vibration of tiny vibration width of face with a high frequency (for example,  $\approx 0.1\text{mm}$  or less), the above-mentioned orifice 28 does not function, but the fluid pressure difference of 1st room 26a and 2nd room 26b is eased with the fluid which moves exceeding a protruding line 62, and a low dynamic spring constant is demonstrated. Thus, a high loss factor and a low dynamic spring constant can be attained abolishing an amplitude dependency as it is the vibration isolator of this operation gestalt, and sufficient engine performance can be demonstrated under different amplitude.

[0031] In the vibration isolator of this operation gestalt, since the wall section 54 prepared in the periphery section of rubber membrane 32 prevents with [ of the 32 round edge of rubber membrane by rapid change of fluid pressure ] \*\*\*\*, generating of the collision sound of rubber membrane 32 and grids 40 and 44 or the noise can be prevented.

[0032] Moreover, discernment of the front flesh side of rubber membrane 32 is easy by having formed the wall section 54 in rubber membrane 32. Moreover, since it excels also in the insertion nature at the time of inserting rubber membrane 32 into the crevice of the orifice member 36 and the periphery section of rubber membrane 32 is not turned over at the time of insertion, the assembly nature of the batch member 30 improves.

[0033] In addition, by radial heights 62b equally arranged in the circumference of an axis, what does not appear on the connection section of grids 40 and 44 exists by having changed the arrangement pitch of the connection section of grids 40 and 44 by the inner circumference and periphery side. However, bearing is not given to the above-mentioned engine performance in order not to bar each through tube 58 of rubber membrane 32, and the bending behavior in every 60, even if it is the protruding line 62 from which it separated from grids 40 and 44 in this way.

[0034] With the above operation gestalt, although the protruding line 62 was formed in rubber membrane 32, a protruding line may be prepared in grids 40 and 44 at one. In this case, the leakage of the fluid between the through tube 58 which adjoins because the protruding line prepared in grids 40 and 44 contacts rubber membrane 32, and 60 is prevented.

[0035] Moreover, in order to position rubber membrane 32 in a hand of cut, you may make it fit in with the heights or the crevice which prepared the lower limit of the wall section 54, prepared notching or a projection at the tip, and was established in the walls 42 and 46 of the orifice member 36 or a dashboard 38, and radial heights 62b which this prepared in rubber membrane 32 can be certainly carried on the connection section of grids 40 and 44.

[0036]

[Effect of the Invention] By having prepared the wall section in the periphery section of elastic membrane as it is the fluid filled system vibration isolator of this invention, it can prevent with [ of the elastic membrane periphery section by rapid change of fluid pressure ] \*\*\*\*, and generating of a collision sound or the noise can be prevented, and the insertion disposition top of elastic membrane and the elastic membrane periphery section are turned over, and the assembly nature of a batch member improves by prevention.

[0037] Moreover, by having prepared the protruding line which encloses each through tube over elastic membrane and a grid in the perimeter, the leakage of the fluid between the through tubes which adjoin under vibration of the large amplitude especially with a low frequency can be prevented, and vibration-proof ability can be improved.

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TECHNICAL FIELD

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[Field of the Invention] This invention relates to the fluid filled system vibration isolator used for mainly supporting oscillating objects, such as an automobile engine, in vibrationproofing.

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PRIOR ART

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[Description of the Prior Art] The 1st fixing metal with which a fluid filled system vibration isolator is generally attached in an oscillating generating object side, such as an engine, The 2nd tubed fixing metal by which attachment immobilization is carried out at the support side of a car-body frame etc. Join together through the vibrationproofing base which consists of rubber material, and counter with a vibrationproofing base and diaphragm is allotted to the lower part side of the 2nd fixing metal of the above. Make a room into a fluid enclosure room among between a vibrationproofing base and diaphragm, and this fluid enclosure room is divided into two by the side of a vibrationproofing base and diaphragm by the batch member. It is constituted so that it may make it come to be open for free passage of both \*\* with an orifice and a periodic-damping function may be achieved according to the liquid convection effect between both the liquid rooms by the orifice, or the vibration-deadening effectiveness of a vibrationproofing base.

[0003] In this fluid filled system vibration isolator, what was constituted from elastic membrane as valve portion material which carries out reciprocation displacement of the batch member, and a grid of the vertical pair which restricts a motion of this elastic membrane is well-known. Under vibration of the large amplitude with a low frequency like vibration resulting from the irregularity of the road surface at the time of car transit, the vibration isolator with such elastic membrane demonstrates a periodic-damping function because a fluid flows for two rooms through an orifice. On the other hand, under vibration of tiny vibration width of face with a high frequency like vibration resulting from an engine rotational frequency, the above-mentioned orifice does not function but demonstrates a periodic-damping function according to reciprocation deformation of elastic membrane.

[0004] What was constituted from a grid of a vertical pair and elastic membrane held between these grids in the French patent public presentation No. 2674590 official report as a batch member into which an up-and-down liquid room is divided is indicated. In this official report, in order to pinch the center section between up-and-down grids, to prepare elastic membrane so that a edge may float, and to prevent generating of the collision sound of elastic membrane and a grid, or the noise which is not desirable, the circular projection which counters a grid is prepared in one [ at least ] field of elastic membrane. This circular projection is equally arranged in the condition of having stood in a line in the shape of a ring on the surface of elastic membrane, and has the function which is gradually pressed by the grid and subsequently loosens elastically at the time of actuation of elastic membrane.

[0005] Moreover, although it is sequential in [ not elastic membrane but a grid ] include angle in order to prevent like the above generating of the collision sound of elastic membrane and a grid, or the noise which is not desirable to JP,6-221368,A, the technique of preparing the rib of the inhomogeneity which does not have a repeat in include angle over the whole surroundings of an axis is indicated.

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EFFECT OF THE INVENTION

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[Effect of the Invention] By having prepared the wall section in the periphery section of elastic membrane as it is the fluid filled system vibration isolator of this invention, it can prevent with [ of the elastic membrane periphery section by rapid change of fluid pressure ] \*\*\*, and generating of a collision sound or the noise can be prevented, and the insertion disposition top of elastic membrane and the elastic membrane periphery section are turned over, and the assembly nature of a batch member improves by prevention.

[0037] Moreover, by having prepared the protruding line which encloses each through tube over elastic membrane and a grid in the perimeter, the leakage of the fluid between the through tubes which adjoin under vibration of the large amplitude especially with a low frequency can be prevented, and vibration-proof ability can be improved.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] According to the vibration isolator of the above-mentioned conventional technique, although a certain extent can reduce a collision sound and the noise with a circular projection or a rib, since the periphery section of elastic membrane is not restrained at all, it is difficult [ it ] to be generated with \*\*\* in the periphery section of elastic membrane by rapid change of fluid pressure, and to not necessarily prevent generating of a collision sound or the noise fully. Moreover, in case the periphery section of elastic membrane is turned over or elastic membrane is inserted between grids at the time of the assembly of a batch member, in plate-like elastic membrane, there is a problem that it is inferior also to assembly nature that it is hard to insert etc.

[0007] Moreover, the above-mentioned circular projection and a rib are prepared in order to mitigate the impulsive sound at the time of colliding with a grid because elastic membrane displaces up and down, and they do not restrict migration of a hoop direction or radial mounting fluid between the through tubes formed of a grid. Therefore, in the above-mentioned vibration isolator, migration (leak) of mounting fluid takes place between the through tubes which adjoin under vibration of the large amplitude with a low frequency, and it is hard to demonstrate the higher engine performance.

[0008] This invention makes it the 1st technical problem to improve assembly nature while it is made in view of such a point and prevents with [ of the periphery section of the elastic membrane in a batch member ] \*\*\*. Let it be the 2nd technical problem for this invention to prevent unnecessary leak of the enclosure fluid between the through tubes of a batch member again, and to improve vibration-proof ability.

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[Translation done.]

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## MEANS

[Means for Solving the Problem] The fluid filled system vibration isolator of this invention which solves the 1st technical problem of the above The vibrationproofing base which consists of the 1st attachment member, the 2nd attachment member, and rubber material that is interposed between these attachment members and combines both the attachment member. The diaphragm which was made to counter said vibrationproofing base and was attached in said 2nd attachment member. The fluid enclosure room prepared between the aforementioned vibrationproofing base and diaphragm, and the batch member which divides said fluid enclosure room into the 1st room by the side of a vibrationproofing base, and the 2nd room by the side of diaphragm. It has the orifice which makes the 1st aforementioned room and the 2nd room open, for free passage. Said batch member The part I material equipped with the 1st wall which is installed from the 1st grid which is faced and allotted to the field on the other hand, and restricts the variation rate and its periphery section of the elastic membrane into which the 1st aforementioned room and the 2nd room are divided, and this elastic membrane, and encloses the periphery of said elastic membrane. And it is installed from the 2nd grid which is faced and allotted to the another side side of said elastic membrane, and restricts the variation rate, and its periphery section, and consists of part II material equipped with the 2nd wall faced and arranged on the inner circumference side of said 1st wall. Said elastic membrane is equipped with the wall section which was installed in one from the periphery section, and was inserted in the gap of the 1st aforementioned wall and the 2nd wall.

[0010] In the fluid filled system vibration isolator of this invention, since it is prevented with [ of the elastic membrane periphery section by rapid change of fluid pressure ] \*\*\*\* by the wall section prepared in the periphery section of elastic membrane, generating of the collision sound of elastic membrane and a grid or the noise which is not desirable can be prevented. moreover, the insertion nature at the time of discernment of the front flesh side of elastic membrane becoming easy, and inserting in the part I material by the above-mentioned wall section, — excelling — further — the elastic membrane periphery section — also being turned over — since it can prevent, the assembly nature of a batch member improves.

[0011] In the fluid filled system vibration isolator of this invention, in order to solve the 2nd technical problem of the above, it is desirable to prepare the protruding line which regulates migration of the fluid between the through tubes which enclose each through tube formed of this grid over the perimeter between the front face of said elastic membrane and the field of said 1st and 2nd grids which counter this, and adjoin it.

[0012] Thus, by having prepared the protruding line which encloses each through tube over elastic membrane and the grid which counters this in the perimeter, the leakage of the fluid between the through tubes by which the above-mentioned protruding line adjoins under vibration of the large amplitude especially with a low frequency is prevented. Therefore, elastic membrane can be sagged for every through tube, and a high loss factor is acquired. Moreover, under vibration of tiny vibration width of face with a high frequency, you may make it a fluid move exceeding the above-mentioned protruding line, the fluid which moves in that case exceeding a protruding line eases a fluid pressure difference, and a low dynamic spring constant is demonstrated.

[0013] The above-mentioned protruding line can be prepared in the field of the grid which counters the front face of elastic membrane, or this at one.

[0014] It consists of two or more annular sections to which said grid extends in a hoop direction, and the connection section which is prolonged in radial and connects said two or more annular sections, and two or more trains of through tube trains which come to arrange two or more through tubes to a hoop direction in this grid are more specifically established. Here Two or more annular heights which said connection section is allotted in a pitch which is different by the inner circumference [ of said grid ], and periphery side, and said protruding line is prepared in said elastic membrane, and are prolonged in a hoop direction corresponding to said annular section of said grid. It may consist of two or more radial heights prolonged in a radial corresponding to said connection section of said grid, and said radial heights may be prolonged in the radial at the equal include angle covering the radial abbreviation overall length of said elastic membrane. In this case, although there are some radial heights which do not appear on the connection section of a grid, even if it is the protruding line from which it separated from the grid in this way, bending behavior for every through tube of elastic membrane is not barred. Therefore, the protruding line equally arranged by the circumference of the axis of elastic membrane does not give trouble to a function, either.

[0015]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained with reference to a drawing.

[0016] Drawing of longitudinal section of the fluid filled system vibration isolator which drawing 1 requires for 1 operation gestalt of this invention, and drawing 2 are the exploded view. This vibration isolator comes to join together the 1st fixing metal 10 attached in an oscillating generating object side, such as an engine, and the 2nd tubed fixing metal 12 by which attachment immobilization is carried out at the support side of a car-body frame etc. through the vibrationproofing base 14 which consists of rubber material.

[0017] The 2nd fixing metal 12 consists of tubed metallic ornaments 16 and bottom metallic ornaments 18 concluded by the lower limit 16a with the caulking means, and the bolt 19 for attachment protrudes on the bottom metallic ornaments 18.

[0018] The 1st fixing metal 10 is the plate-like part material which set necessary spacing to the axial center section upper part of the 2nd fixing metal 12, and was allotted to it, and the bolt 20 for attachment protrudes on the center section towards the upper part.

[0019] The 1st fixing metal 10 fixed [ the appearance ] the abbreviation truncated cone form with the vulcanization shaping means on nothing and its top face, and the upper limit section of the 2nd fixing metal 12 has fixed the vibrationproofing base 14 with the vulcanization shaping means in the lower limit periphery section. In the case of drawing, diameter expansion formation of the upper limit section 16b of the tubed metallic ornaments 16 is carried out at the shape of a taper, and vulcanization adhesion of the lower periphery of the vibrationproofing base 14 is carried out at this upper limit section 16b. Thin film rubber section 14a installed in the shape of a thin film from the vibrationproofing base 14 is prepared in the internal surface of the 2nd fixing metal 12.

[0020] The lower part side of the 2nd fixing metal 12 is equipped with the diaphragm 22 which consists of rubber membrane so that it may counter with the vibrationproofing base 14. Diaphragm 22 equips the periphery section with the ring-like reinforcement metallic ornaments 24, and it is attached in the 2nd fixing metal 12 by these reinforcement metallic ornaments 24 making it go away with the tubed metallic ornaments 16 and the bottom metallic ornaments 18, and caulking immobilization being carried out at the section.

[0021] Inside the 2nd fixing metal 12, the fluid enclosure room 26 sealed between diaphragm 22 and the vibrationproofing base 14 is formed,

and the liquid as a fluid is enclosed with this fluid enclosure room 26. the disc-like batch member 30 which has an orifice 28 at a periphery in the inner circumference of the 2nd fixing member 36 in the fluid enclosure room 26 — liquid — it is attached densely. The fluid enclosure room 26 is divided into 1st room 26a by the side of vibrationproofing base, and 2nd room 26b by the side of diaphragm by this batch member 30, and both \*\* 26a and 26b are made open for free passage by the orifice 28.

[0022] The batch member 30 consists of disc-like rubber membrane 32 as valve portion material which divides 1st room 26a and 2nd room 26b, an orifice member 36 equipped with the slot 34 for forming an orifice 28 in a periphery, and a dashboard 38 that presses the periphery edge of the orifice member 36 to the vibrationproofing base 14 side.

[0023] The orifice member 36 is a metal or the mold Plastic solid of resin, and is equipped with the grid 40 faced and allotted to the top face of rubber membrane 32, and the wall 42 which is installed from the periphery section and encloses the periphery of rubber membrane 32. The orifice member 36 becomes a detail from the cylinder-like wall 42 and the circular grid 40 over which it was built so that the interior might be divided up and down in a shaft-orientations center section. And the slot 34 which extends over 2 rounds of upper and lower sides is formed in a hoop direction at the peripheral face of a wall 42, and let space surrounded by this slot 34 and thin film rubber section 14a of the vibrationproofing base 14 be an orifice 28.

[0024] A dashboard 38 is the press-forming object of a metal plate, and is equipped with the grid 44 faced and allotted to the inferior surface of tongue of rubber membrane 32, and the wall 46 which is installed from the periphery section, and is faced and arranged on the inner circumference side of the wall 42 of the orifice member 36. The grid 44 to which a dashboard 38 becomes a detail from the circular central shelf projected up, It consists of a periphery edge 48 installed by the method of the outside of the direction of a path from the lower limit of the cylinder-like wall 46 caudad installed from the periphery section, and a wall 46, and the periphery edge 48 is attached in the 2nd fixing metal 12 by making it go away with the tubed metallic ornaments 16 and the bottom metallic ornaments 18, and caulking immobilization being carried out at the section.

[0025] The openings 37 and 39 for making 1st room 26a and 2nd room 26b open an orifice 28 for free passage are formed in the orifice member 36 and the dashboard 38, respectively.

[0026] Rubber membrane 32 is allotted in the clearance (hold space) 50 formed between the grid 40 of the orifice member 36 which faced 1st room 26a, and the grid 44 of the dashboard 38 facing 2nd room 26b, and the variation rate of the vertical direction is restricted between both the grids 40 and 44. the dimension (height) of a clearance 50 is greatly set up a little rather than the thickness of rubber membrane 32 — having — \*\*\*\* — thereby — vertical movement of rubber membrane 32 — the variation rate is made possible.

[0027] Rubber membrane 32 is formed in saccate [ which bent the periphery edge caudad ] as shown in drawing 3 . That is, rubber membrane 32 consists of a disc-like body 52 and the wall section 54 caudad installed in one from the periphery section. And this wall section 54 is inserted in the gap 56 formed between the wall 42 of the orifice member 36, and the wall 46 of a dashboard 38 as shown in drawing 1 . the dimension of this gap 56 is greatly set up a little rather than the thickness of the wall section 54, and a clearance secures it, respectively between the wall section 54 and its internal and external walls 42 and 46 — having — \*\*\*\* — thereby — vertical movement of rubber membrane 32 — the variation rate is possible. Moreover, the shaft-orientations die length (height) of the wall section 54 is set up so that the lower limit may not contact the periphery edge 48 of a dashboard 38.

[0028] The grid 40 of the orifice member 36 and the grid 44 of a dashboard 38 have the same grid configuration. As shown in drawing 5 , the grid 44 of a dashboard 38 becomes a detail from connection section 44b which connects between three concentric annular sections 44a prolonged in a hoop direction, and the two annular sections which prolong and adjoin radial. Connection section 44b is allotted in a pitch which is different by the inner circumference [ of a grid 44 ], and periphery side, in the case of drawing, connection section 44b by the side of inner circumference is prepared at intervals of 90 degrees, and eight connection section 44b by the side of 4 and a periphery is prepared at intervals of 45 degrees. Moreover, both shift 22.5 degrees of phases and are prepared so that all of connection section 44b by the side of inner circumference and connection section 44b by the side of a periphery may not be in agreement. Although the through tube train which comes to arrange the through tube 58 of the shape of two or more slot is prepared in a hoop direction in this grid 44 at two trains by the side of inner circumference and a periphery, as for a through tube 58, eight pieces are prepared by the four-piece and periphery side by the inner circumference side by having changed the pitch of connection section 44b as mentioned above. Thus, by lessening the number of through tubes 58 by the inner circumference side, the opening area of each through tube 58 by the side of inner circumference is greatly securable to the same extent a periphery side. It is the same configuration as the grid 44 of the dashboard 38 which also described above the grid 40 of the orifice member 36, therefore the through tube 60 is formed in the orifice member 36 by the same configuration and the arrangement as the through tube 58 of a dashboard 38. And the orifice member 36 and a dashboard 38 are attached so that it may be allotted to the location whose mutual through tubes 58 and 60 corresponded.

[0029] The protruding line 62 which encloses the periphery of each through tubes 58 and 60 over the perimeter in contact with the field where the above-mentioned grids 40 and 44 counter is projected and formed in the front face of rubber membrane 32 at one. The protruding line 62 is formed in vertical both sides of rubber membrane 32 in the same configuration, as shown in drawing 4 . As shown in drawing 5 , specifically, a protruding line 62 consists of radial heights 62b prolonged in a radial corresponding to three connection sections of concentric annular heights 62a and grid 44 extend in hoop direction corresponding to annular section 44a of grid 44. This radial heights 62b is prolonged covering the radial abbreviation overall length from the core of rubber membrane 32. Moreover, radial heights 62b is prepared at intervals of 22.5 degrees as appeared in all connection section 44b of a grid 44 in at least one, and so that a radial may be prolonged at an equal include angle.

[0030] As mentioned above, under vibration of the low large amplitude (for example,  $\approx 0.3\text{mm}$  or more) of a frequency, when a fluid flows between two-room 26a and 26b through an orifice 28, as for the vibration isolator of this becoming operation gestalt, a periodic-damping function is demonstrated. Moreover, the leakage of the fluid between the through tube 58 which adjoins a hoop direction or radial, and 60 is prevented by contacting the bearing side of grids 40 and 44 where the protruding line 62 prepared in rubber membrane 32 faces. Therefore, rubber membrane 32 can be sagged for every [ each through tube 58 and ] 60, and a high loss factor is acquired. On the other hand, under vibration of tiny vibration width of face with a high frequency (for example,  $\approx 0.1\text{mm}$  or less), the above-mentioned orifice 28 does not function, but the fluid pressure difference of 1st room 26a and 2nd room 26b is eased with the fluid which moves exceeding a protruding line 62, and a low dynamic spring constant is demonstrated. Thus, a high loss factor and a low dynamic spring constant can be attained abolishing an amplitude dependency as it is the vibration isolator of this operation gestalt, and sufficient engine performance can be demonstrated under different amplitude.

[0031] In the vibration isolator of this operation gestalt, since the wall section 54 prepared in the periphery section of rubber membrane 32 prevents with [ of the 32 round edge of rubber membrane by rapid change of fluid pressure ] \*\*\*\*, generating of the collision sound of rubber membrane 32 and grids 40 and 44 or the noise can be prevented.

[0032] Moreover, discernment of the front flesh side of rubber membrane 32 is easy by having formed the wall section 54 in rubber membrane 32. Moreover, since it excels also in the insertion nature at the time of inserting rubber membrane 32 into the crevice of the orifice member 36 and the periphery section of rubber membrane 32 is not turned over at the time of insertion, the assembly nature of the batch member 30 improves.

[0033] In addition, by radial heights 62b equally arranged in the circumference of an axis, what does not appear on the connection section of grids 40 and 44 exists by having changed the arrangement pitch of the connection section of grids 40 and 44 by the inner circumference and

periphery side. However, bearing is not given to the above-mentioned engine performance in order not to bar each through tube 58 of rubber membrane 32, and the bending behavior in a 60, even if it is the protruding line 62 from which it is separated from grids 40 and 44 in this way.

[0034] With the above operation gestalt, although the protruding line 62 was formed in rubber membrane 32, a protruding line may be prepared in grids 40 and 44 at one. In this case, the leakage of the fluid between the through tube 58 which adjoins because the protruding line prepared in grids 40 and 44 contacts rubber membrane 32, and 60 is prevented.

[0035] Moreover, in order to position rubber membrane 32 in a hand of cut, you may make it fit in with the heights or the crevice which prepared the lower limit of the wall section 54, prepared notching or a projection at the tip, and was established in the walls 42 and 46 of the orifice member 36 or a dashboard 38, and radial heights 62b which this prepared in rubber membrane 32 can be certainly carried on the connection section of grids 40 and 44.

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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## [Brief Description of the Drawings]

[Drawing 1] It is drawing of longitudinal section of the vibration isolator concerning 1 operation gestalt of this invention.

[Drawing 2] It is the sectional view disassembling and showing this vibration isolator.

[Drawing 3] It is the strabism sectional view of the rubber membrane in an operation gestalt.

[Drawing 4] It is the expanded sectional view of this rubber membrane.

[Drawing 5] (a) is a top view in the condition that the perspective view of a dashboard and (b) combined the perspective view of rubber membrane, and (c) combined a dashboard and rubber membrane.

## [Description of Notations]

- 10 .... The 1st fixing metal
- 12 .... The 2nd fixing metal
- 14 .... Vibrationproofing base
- 22 .... Diaphram
- 26 .... Fluid enclosure room
- 28 .... Orifice
- 30 .... Batch member
- 32 .... Rubber membrane
- 36 .... Orifice member (part I material)
- 38 .... Dashboard (part II material)
- 40 44 .... Grid
- 42 46 .... Wall
- 54 .... Wall section
- 56 .... Gap
- 58 60 .... Through tube
- 62 .... Protruding line

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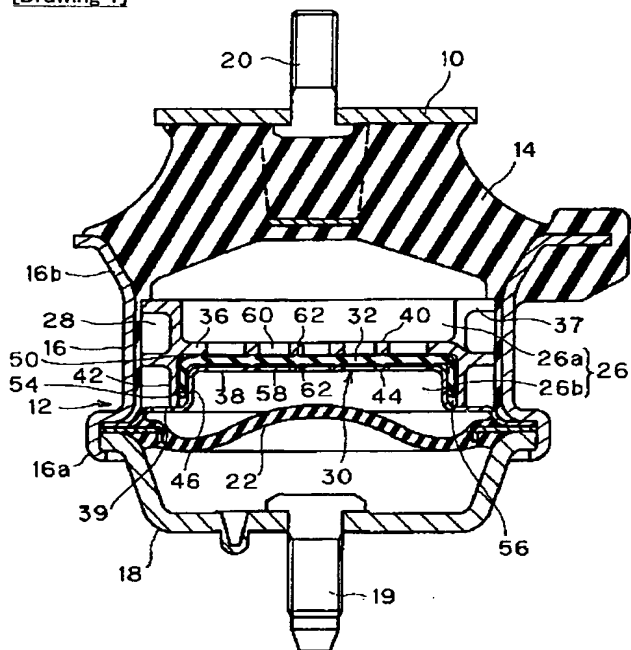
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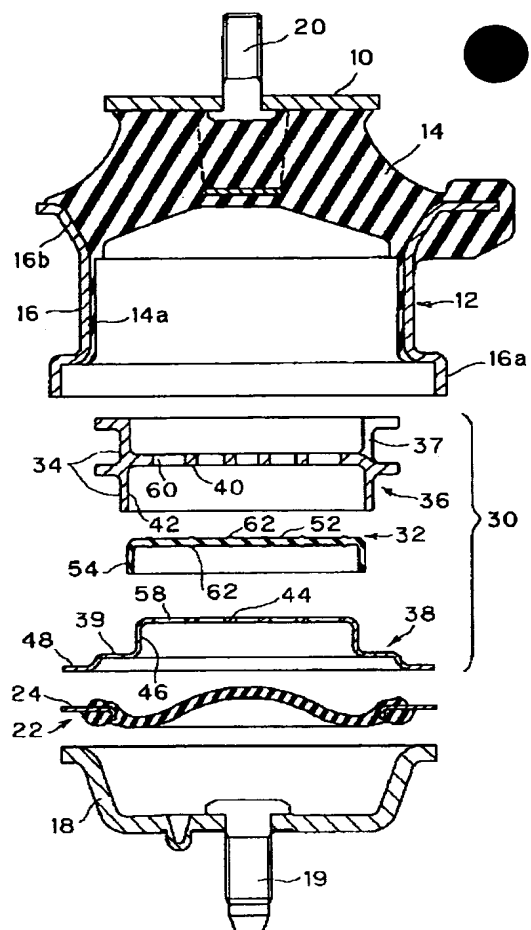
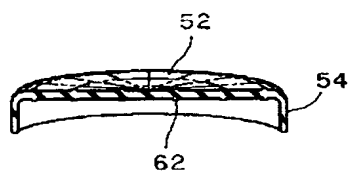
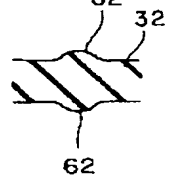
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## DRAWINGS

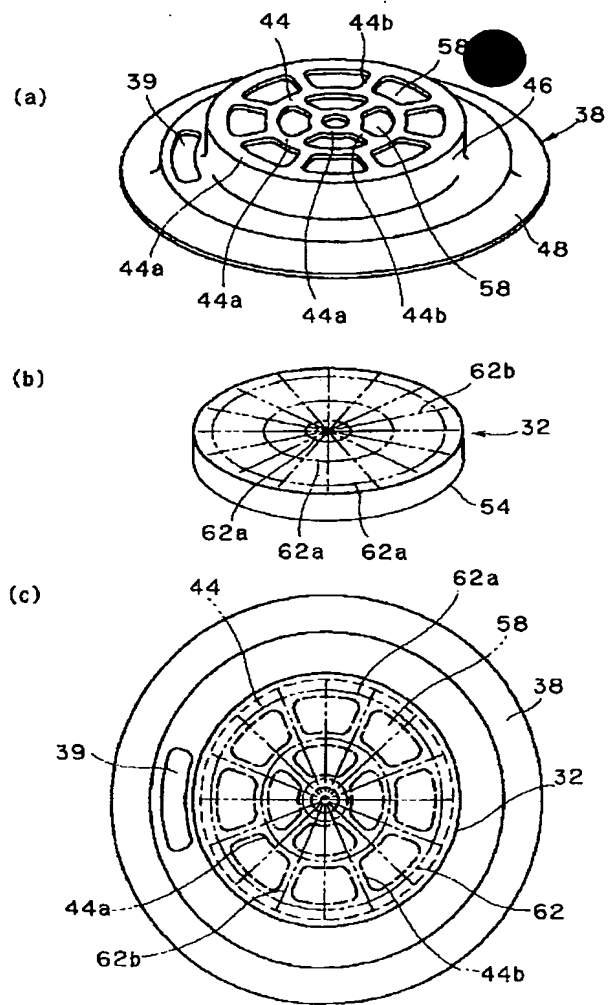
[Drawing 1]



[Drawing 2]

[Drawing 3]  
32[Drawing 4]  
62

[Drawing 5]



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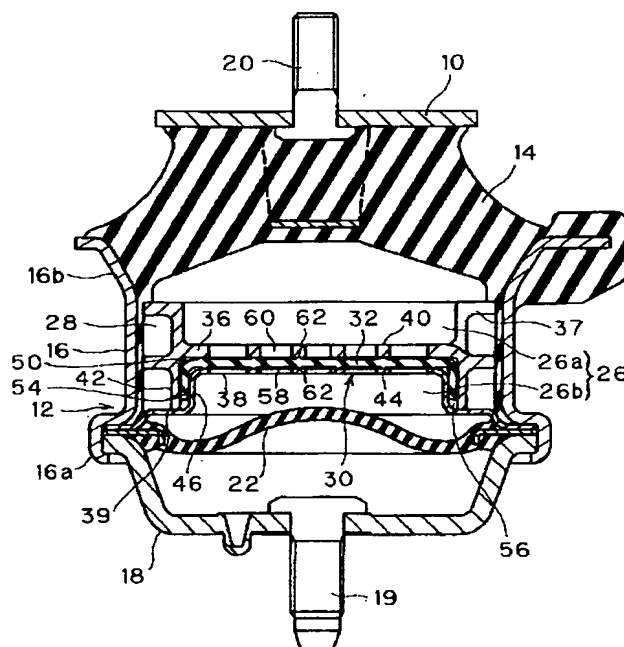
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(54) 【発明の名称】 流体封入式防振装置

(57) 【要約】

【課題】 流体封入式防振装置において、仕切部材における弾性膜周縁部のばたつきを防止するとともに、組み立て性を向上する。

【解決手段】 第1及び第2の取付部材10、12が防振基体14を介して結合され、防振基体14とダイヤフラム22との間に設けられた流体封入室26が仕切部材30により2室に仕切られ、両室26a、26bがオリフィス28で連通させた防振装置において、仕切部材30が、両室26a、26bを仕切る弾性膜32、弾性膜32の上面に相対して配された格子40とその周縁部から延設された縦壁42とを備えるオリフィス部材36、及び、弾性膜32の下面に相対して配された格子44とその周縁部から延設されて上記縦壁42の内周側に相対して配された縦壁46とを備える仕切板38からなり、弾性膜32の周縁部から縦壁部54を一体に延設してこれを上記縦壁42、46の間隙56に挿入した。



**【特許請求の範囲】**

【請求項 1】第 1 取付部材と、第 2 取付部材と、これら取付部材の間に介設されて両取付部材を結合するゴム材よりなる防振基体と、前記防振基体に対向させて前記第 2 取付部材に取り付けたダイヤフラムと、前記の防振基体とダイヤフラムとの間に設けられた流体封入室と、前記流体封入室を防振基体側の第 1 室とダイヤフラム側の第 2 室とに仕切る仕切部材と、前記の第 1 室と第 2 室を連通させるオリフィスと、を備え、

前記仕切部材が、前記の第 1 室と第 2 室を仕切る弾性膜、該弾性膜の一方面に相対して配されてその変位を制限する第 1 の格子とその周縁部から延設されて前記弾性膜の外周を取り囲む第 1 の縦壁とを備える第 1 部材、及び、前記弾性膜の他方面に相対して配されてその変位を制限する第 2 の格子とその周縁部から延設されて前記第 1 の縦壁の内周側に相対して配された第 2 の縦壁とを備える第 2 部材からなり、

前記弾性膜は、その周縁部から一体に延設されて前記の第 1 の縦壁と第 2 の縦壁との間隙に挿入された縦壁部を備えることを特徴とする流体封入式防振装置。

【請求項 2】前記弾性膜の表面とこれに対向する前記第 1 及び第 2 の格子の面との間に、該格子により形成される各貫通孔を全周にわたって取り囲み隣接する貫通孔間での流体の移動を規制する凸条を設けたことを特徴とする請求項 1 記載の流体封入式防振装置。

【請求項 3】前記凸条が、前記弾性膜の表面又はこれに対向する前記格子の面に一体に設けられたことを特徴とする請求項 2 記載の流体封入式防振装置。

【請求項 4】前記格子が、周方向に延びる複数の環状部と、半径方向に延びて前記複数の環状部を連結する連結部とからなり、該格子により周方向に複数の貫通孔を配置してなる貫通孔列が 2 列以上設けられ、ここで、前記連結部は前記格子の内周側と外周側とで異なるピッチで配されており、

前記凸条が、前記弾性膜に設けられており、前記格子の前記環状部に対応して周方向に延びる複数の環状凸部と、前記格子の前記連結部に対応して放射状に延びる複数の放射状凸部とからなり、

前記放射状凸部は、前記弾性膜の半径方向の略全長にわたって、かつ、均等な角度で放射状に延びていることを特徴とする請求項 2 又は 3 記載の流体封入式防振装置。

**【発明の詳細な説明】****【0001】**

【発明の属する技術分野】本発明は、主として自動車エンジン等の振動体を防振的に支承するのに用いられる流体封入式防振装置に関するものである。

**【0002】**

【従来の技術】一般に、流体封入式防振装置は、エンジン等の振動発生体側に取り付けられる第 1 取付金具と、車体フレーム等の支持側に取付固定される筒状の第 2 取

付金具とを、ゴム材よりなる防振基体を介して結合し、上記第 2 取付金具の下部側に防振基体と対向してダイヤフラムを配し、防振基体とダイヤフラムとの間の内室を流体封入室とし、この流体封入室を仕切部材により防振基体側とダイヤフラム側との 2 室に仕切り、両室をオリフィスにより連通せしめてなり、オリフィスによる両液室間の液流動効果や防振基体の制振効果により、振動減衰機能を果たすように構成されている。

【0003】かかる流体封入式防振装置において、仕切部材を、往復動変位する弁部材としての弾性膜と、該弾性膜の動きを制限する上下一対の格子とで構成したものが公知である。このような弾性膜を持つ防振装置は、車両走行時の路面の凹凸に起因する振動のような周波数の低い大振幅の振動下では、流体がオリフィスを通して 2 室間を流動することで振動減衰機能を発揮する。一方、エンジンの回転数に起因する振動のような周波数の高い微振幅の振動下では、上記オリフィスは機能せず、弾性膜の往復動変形により振動減衰機能を発揮する。

【0004】フランス国特許公開第 2 6 7 4 5 9 0 号公報には、上下の液室を仕切る仕切部材として、上下一対の格子と、該格子間に保持された弾性膜とで構成したものが開示されている。同公報では、弾性膜は、その中央部が上下の格子間に挟持され、縁部が浮動するように設けられており、弾性膜と格子との衝突音や望ましくない騒音の発生を防止するため、弾性膜の少なくとも一方の面には格子に対向する円形突起が設けられている。この円形突起は、弾性膜の表面にリング状に並んだ状態で均等に配置されており、弾性膜の作動時に、格子に段階的に押圧され次いで弾性的に弛緩する機能を持っている。

【0005】また、特開平 6-221368 号公報には、上記と同様に弾性膜と格子との衝突音や望ましくない騒音の発生を防止するため、弾性膜ではなく格子に、角度的には順次であるが、軸線の回り全体にわたって角度的に繰り返しのない不均等性のリブを設ける技術が開示されている。

**【0006】**

【発明が解決しようとする課題】上記従来技術の防振装置によれば、円形突起やリブによって衝突音や騒音をある程度は低減することができるが、弾性膜の周縁部が何ら拘束されていないため、急激な液圧の変化により弾性膜の周縁部にばたつきが生じてしまい、衝突音や騒音の発生を必ずしも十分に防止することは難しい。また、仕切部材の組み立て時において、弾性膜の周縁部がめくれてしまったり、格子間に弾性膜を挿入する際に平板状の弾性膜では挿入しにくいなど、組み立て性にも劣るという問題がある。

【0007】また、上記の円形突起やリブは、弾性膜が上下に変位することで格子に衝突する際の衝撃音を軽減するために設けられたものであり、格子により形成される貫通孔間において、周方向や半径方向での封入液の移

動を制限するものではない。そのため、上記の防振装置では、周波数の低い大振幅の振動下において、隣接する貫通孔間で封入液の移動（リーク）が起こり、より高い性能を発揮し難い。

【0008】本発明は、このような点に鑑みてなされたものであり、仕切部材における弾性膜の周縁部のばたつきを防止するとともに、組み立て性を向上することを第1の課題とする。本発明は、また、仕切部材の貫通孔間における封入流体の不必要なリークを防止して、防振性能を向上することを第2の課題とする。

【0009】

【課題を解決するための手段】上記第1の課題を解決する本発明の流体封入式防振装置は、第1取付部材と、第2取付部材と、これら取付部材の間に介設されて両取付部材を結合するゴム材よりなる防振基体と、前記防振基体に対向させて前記第2取付部材に取り付けたダイヤフラムと、前記の防振基体とダイヤフラムとの間に設けられた流体封入室と、前記流体封入室を防振基体側の第1室とダイヤフラム側の第2室とに仕切る仕切部材と、前記の第1室と第2室を連通させるオリフィスと、を備え、前記仕切部材が、前記の第1室と第2室を仕切る弾性膜、該弾性膜の一方面に相対して配されてその変位を制限する第1の格子とその周縁部から延設されて前記弾性膜の外周を取り囲む第1の縦壁とを備える第1部材、及び、前記弾性膜の他方面に相対して配されてその変位を制限する第2の格子とその周縁部から延設されて前記第1の縦壁の内周側に相対して配された第2の縦壁とを備える第2部材からなり、前記弾性膜は、その周縁部から一体に延設されて前記の第1の縦壁と第2の縦壁との間隙に挿入された縦壁部を備えるものである。

【0010】本発明の流体封入式防振装置では、弾性膜の周縁部に設けた縦壁部により、急激な液圧の変化による弾性膜周縁部のばたつきが防止されるので、弾性膜と格子との衝突音や望ましくない騒音の発生を防止することができる。また、上記縦壁部により、弾性膜の表裏の識別が容易となり、また第1部材に挿入する際の挿入性にも優れ、更に弾性膜周縁部のめくれも防止できるので、仕切部材の組み立て性が向上する。

【0011】本発明の流体封入式防振装置においては、上記第2の課題を解決するために、前記弾性膜の表面とこれに対向する前記第1及び第2の格子の面との間に、該格子により形成される各貫通孔を全周にわたって取り囲み隣接する貫通孔間での流体の移動を規制する凸条を設けることが好ましい。

【0012】このように弾性膜とこれに対向する格子との間に各貫通孔を全周にわたって取り囲む凸条を設けたことにより、特に周波数の低い大振幅の振動下において、上記凸条が、隣接する貫通孔間での流体の漏れを防止する。そのため、弾性膜を各貫通孔ごとに挟ませることができ、高いロスファクターが得られる。また、周波

数の高い微振幅の振動下では、流体が上記凸条を越えて移動するようにしてもよく、その場合、凸条を越えて移動する流体が液圧差を緩和して低動ばね定数を発揮する。

【0013】上記凸条は、弾性膜の表面又はこれに対向する格子の面に一体に設けることができる。

【0014】より具体的には、前記格子が、周方向に延びる複数の環状部と、半径方向に延びて前記複数の環状部を連結する連結部とからなり、該格子により周方向に複数の貫通孔を配置してなる貫通孔列が2列以上設けられ、ここで、前記連結部は前記格子の内周側と外周側とで異なるピッチで配されており、前記凸条が、前記弾性膜に設けられており、前記格子の前記環状部に対応して周方向に延びる複数の環状凸部と、前記格子の前記連結部に対応して放射状に延びる複数の放射状凸部とからなり、前記放射状凸部は、前記弾性膜の半径方向の略全長にわたって、かつ、均等な角度で放射状に延びている場合がある。この場合、放射状凸部の中には格子の連結部上に載らないものもあるが、このように格子から外れた凸条であっても弾性膜の各貫通孔ごとの撓み挙動を妨げることはない。そのため、弾性膜の軸線回りで均等に配置した凸条でも機能に支障を与えない。

【0015】

【発明の実施の形態】以下、本発明の実施形態を図面を参照して説明する。

【0016】図1は本発明の1実施形態に係る流体封入式防振装置の縦断面図、図2はその分解図である。この防振装置は、エンジン等の振動発生体側に取り付けられる第1取付金具10と、車体フレーム等の支持側に取付固定される筒状の第2取付金具12とを、ゴム材よりなる防振基体14を介して結合してなる。

【0017】第2取付金具12は、筒状金具16と、その下端16aにかしめ手段により締結された底金具18とからなり、底金具18に取付用ボルト19が突設されている。

【0018】第1取付金具10は、第2取付金具12の軸心部上方に所要の間隔をおいて配された板状部材であり、その中央部に取付用ボルト20が上方に向けて突設されている。

【0019】防振基体14は、外形が略截頭円錐形をなし、その上面に第1取付金具10が加硫成形手段により固着され、下端外周部に第2取付金具12の上端部が加硫成形手段により固着されている。図の場合、筒状金具16の上端部16bがテーパ状に拡径形成されており、該上端部16bに防振基体14の下部外周が加硫接着されている。第2取付金具12の内壁面には、防振基体14から薄膜状に延設された薄膜ゴム部14aが設けられている。

【0020】第2取付金具12の下部側には、防振基体14と対向するようにゴム膜よりなるダイヤフラム22

が装着されている。ダイヤフラム22は、外周部にリング状の補強金具24を備え、この補強金具24が筒状金具16と底金具18とのかしめ部にかしめ固定されることで第2取付金具12に取り付けられている。

【0021】第2取付金具12の内側には、ダイヤフラム22と防振基体14との間に密閉された流体封入室26が形成されており、この流体封入室26に流体としての液体が封入されている。流体封入室26における第2取付金具12の内周には、外周にオリフィス28を有する円盤状の仕切部材30が液密に嵌着されている。流体封入室26は、この仕切部材30により防振基体側の第1室26aとダイヤフラム側の第2室26bとに仕切られており、両室26a、26bがオリフィス28により連通せしめられている。

【0022】仕切部材30は、第1室26aと第2室26bとを仕切る弁部材としての円板状のゴム膜32と、外周にオリフィス28を形成するための溝34を備えるオリフィス部材36と、オリフィス部材36の外周縁部を防振基体14側に押圧する仕切板38とで構成されている。

【0023】オリフィス部材36は、金属又は樹脂のモールド成形体であって、ゴム膜32の上面に相対して配された格子40と、その周縁部から延設されてゴム膜32の外周を取り囲む縦壁42とを備える。詳細には、オリフィス部材36は、円筒状の縦壁42と、その内部を軸方向中央部において上下に区切るように架け渡された円形の格子40とからなる。そして、縦壁42の外周面に、周方向に上下2周にわたって延びる溝34が形成され、この溝34と防振基体14の薄膜ゴム部14aとで囲まれた空間がオリフィス28とされている。

【0024】仕切板38は、金属板のプレス成形体であって、ゴム膜32の下面に相対して配された格子44と、その周縁部から延設されてオリフィス部材36の縦壁42の内周側に相対して配される縦壁46とを備える。詳細には、仕切板38は、上方に突出した円形の中央棚部からなる格子44と、その周縁部から下方に延設された円筒状の縦壁46と、縦壁46の下端から径方向外方に延設された外周縁部48とからなり、外周縁部48が筒状金具16と底金具18とのかしめ部にかしめ固定されることで第2取付金具12に取り付けられている。

【0025】オリフィス部材36と仕切板38には、オリフィス28を第1室26aと第2室26bに連通させるための開口37、39がそれぞれ設けられている。

【0026】ゴム膜32は、第1室26aに面したオリフィス部材36の格子40と第2室26bに面した仕切板38の格子44との間で形成される隙間（収容空間）50内に配されて、両格子40、44間で上下方向の変位が制限されている。隙間50の寸法（高さ）は、ゴム膜32の厚みよりも若干大きく設定されており、これに

よりゴム膜32の上下動変位を可能にしている。

【0027】ゴム膜32は、図3に示すように、その外周端部を下方に折曲した袋状に形成されている。すなわち、ゴム膜32は、円板状の本体52と、その周縁部から下方に一体に延設された縦壁部54からなる。そして、この縦壁部54が、図1に示すように、オリフィス部材36の縦壁42と仕切板38の縦壁46との間で形成される隙間56に挿入されている。この隙間56の寸法は縦壁部54の厚みよりも若干大きく設定され、かつ、縦壁部54とその内外の縦壁42、46との間にはそれぞれ隙間が確保されており、これによりゴム膜32の上下動変位が可能になっている。また、縦壁部54の軸方向長さ（高さ）は、その下端が仕切板38の外周縁部48に当接しないように設定されている。

【0028】オリフィス部材36の格子40と仕切板38の格子44は同一の格子形状を持っている。詳細には、図5に示すように、仕切板38の格子44は、周方向に延びる3本の同心状の環状部44aと、半径方向に延びて隣接する2つの環状部間を連結する連結部44bとからなる。連結部44bは、格子44の内周側と外周側とで異なるピッチで配されており、図の場合、内周側の連結部44bは90°間隔で4本、外周側の連結部44bは45°間隔で8本設けられている。また、内周側の連結部44bと外周側の連結部44bとが全て一致しないように、両者は位相を22.5°ずらして設けられている。この格子44により、周方向に複数の長穴状の貫通孔58を配置してなる貫通孔列が内周側と外周側との2列に設けられるが、上記のように連結部44bのピッチを変えたことにより、貫通孔58は内周側で4個、外周側で8個が設けられる。このように内周側で貫通孔58の数を少なくすることで、内周側の各貫通孔58の開口面積を、外周側と同程度に、大きく確保することができる。オリフィス部材36の格子40も上記した仕切板38の格子44と同一形状であり、従って、オリフィス部材36には仕切板38の貫通孔58と同一の形状及び配置にて貫通孔60が設けられている。そして、オリフィス部材36と仕切板38は互いの貫通孔58、60が一致した位置に配されるように組付けられる。

【0029】ゴム膜32の表面には、上記格子40、44の対向する面に当接して各貫通孔58、60の外周を全周にわたって取り囲む凸条62が一体に突出形成されている。凸条62は、図4に示すように、ゴム膜32の上下両面に同一形状にて設けられている。具体的には、図5に示すように、凸条62は、格子44の環状部44aに対応して周方向に延びる3本の同心状の環状凸部62aと、格子44の連結部44bに対応して放射状に延びる放射状凸部62bとからなる。この放射状凸部62bは、ゴム膜32の中心から半径方向の略全長にわたって延びている。また、放射状凸部62bは、格子44の全ての連結部44bに少なくとも1本が載るように、か

つ、均等な角度で放射状の延びるように、22.5°間隔で設けられている。

【0030】以上よりなる本実施形態の防振装置は、周波数の低い大振幅（例えば±0.3mm以上）の振動下では、流体がオリフィス28を通して2室26a、26b間を流動することにより振動減衰機能が發揮される。また、ゴム膜32に設けた凸条62が相対する格子40、44の支承面に当接することにより、周方向又は半径方向に隣接する貫通孔58、60間での流体の漏れが防止される。そのため、ゴム膜32を各貫通孔58、60ごとに撓ませることができ、高いロスファクターが得られる。一方、周波数の高い微振幅（例えば±0.1mm以下）の振動下では、上記オリフィス28は機能せず、凸条62を越えて移動する流体により第1室26aと第2室26bとの液圧差が緩和されて低動ばね定数が發揮される。このように本実施形態の防振装置であると、振幅依存性をなくしつつ高いロスファクターと低動ばね定数を達成することができ、異なる振幅下において十分な性能を發揮させることができる。

【0031】本実施形態の防振装置では、また、ゴム膜32の周縁部に設けた縦壁部54が、急激な液圧の変化によるゴム膜32周縁部のばたつきを防止するため、ゴム膜32と格子40、44との衝突音や騒音の発生を防止することができる。

【0032】また、ゴム膜32に縦壁部54を設けたことにより、ゴム膜32の表裏の識別が容易である。また、ゴム膜32をオリフィス部材36の凹部内に挿入する際の挿入性にも優れ、挿入時にゴム膜32の周縁部がめくれないことがないため、仕切部材30の組み立て性が向上する。

【0033】なお、格子40、44の連結部の配設ピッチを内周側と外周側で変えたことにより、軸線回りに均等に配設した放射状凸部62bでは、格子40、44の連結部上に載らないものも存在する。但し、このように格子40、44から外れた凸条62であってもゴム膜32の各貫通孔58、60ごとの撓み挙動を妨げることはないため、上記した性能に支承を与えない。

【0034】以上の実施形態では、ゴム膜32に凸条62を設けたが、凸条は格子40、44に一体に設けてもよい。この場合、格子40、44に設けた凸条がゴム膜32に当接することで隣接する貫通孔58、60間での流体の漏れが防止される。

【0035】また、ゴム膜32を回転方向で位置決めするために、縦壁部54の下端、即ち先端に切欠または突

起を設けて、オリフィス部材36または仕切板38の縦壁42、46に設けた凸部または凹部と嵌合するようにしてもよく、これによりゴム膜32に設けた放射状凸部62bを格子40、44の連結部上に確実に載せることができる。

#### 【0036】

【発明の効果】本発明の流体封入式防振装置であると、弾性膜の周縁部に縦壁部を設けたことにより、急激な液圧の変化による弾性膜周縁部のばたつきを防止して衝突音や騒音の発生を防止することができ、また、弾性膜の挿入性向上、弾性膜周縁部のめくれ防止により、仕切部材の組み立て性が向上する。

【0037】また、弾性膜と格子との間に各貫通孔を全周にわたって取り囲む凸条を設けたことにより、特に周波数の低い大振幅の振動下において隣接する貫通孔間での流体の漏れを防止することができ、防振性能を向上することができる。

#### 【図面の簡単な説明】

【図1】本発明の1実施形態に係る防振装置の縦断面図である。

【図2】同防振装置を分解して示す断面図である。

【図3】実施形態におけるゴム膜の斜視断面図である。

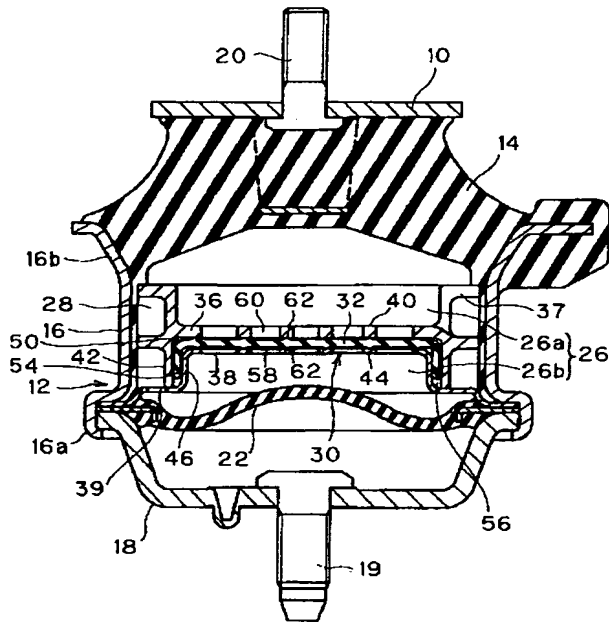
【図4】同ゴム膜の拡大断面図である。

【図5】（a）は仕切板の斜視図、（b）はゴム膜の斜視図、（c）は仕切板とゴム膜を組み合わせた状態での平面図である。

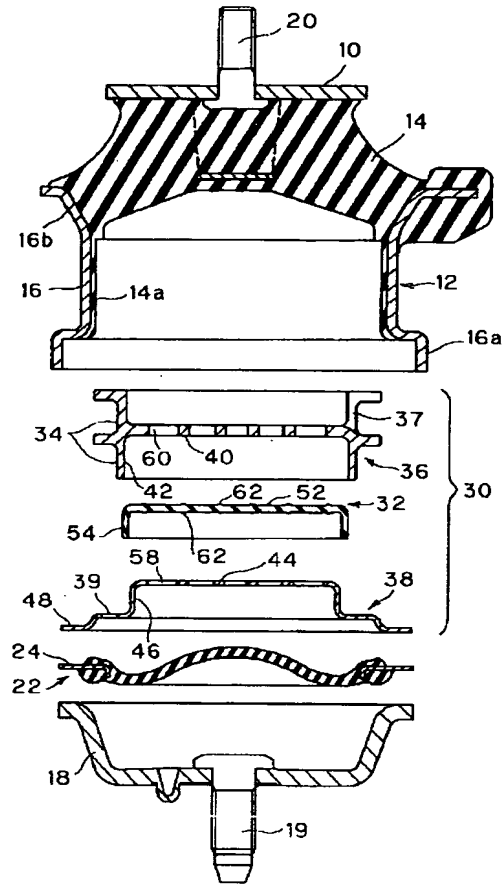
#### 【符号の説明】

- 10……第1取付金具
- 12……第2取付金具
- 14……防振基体
- 22……ダイヤフラム
- 26……流体封入室
- 28……オリフィス
- 30……仕切部材
- 32……ゴム膜
- 36……オリフィス部材（第1部材）
- 38……仕切板（第2部材）
- 40、44……格子
- 42、46……縦壁
- 54……縦壁部
- 56……間隙
- 58、60……貫通孔
- 62……凸条

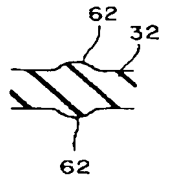
【図1】



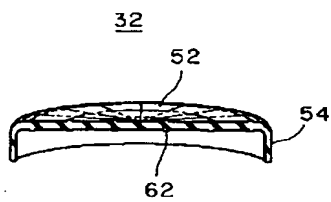
【図2】



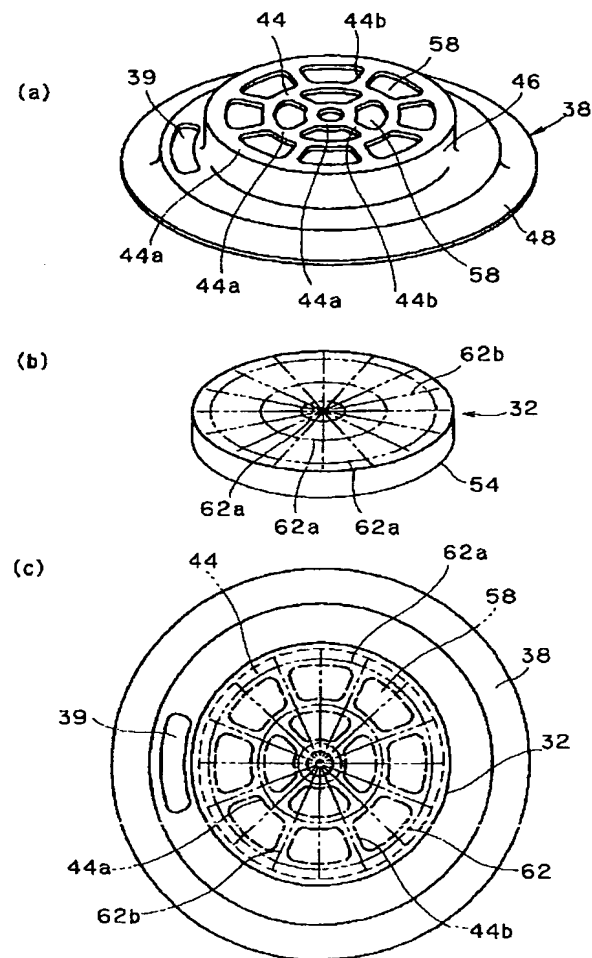
【図4】



【図3】



【図5】



フロントページの続き

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